

Interactive comment on “Antarctic high-resolution ice flow mapping and increased mass loss in Wilkes Land, East Antarctica during 2006–2015” by Qiang Shen et al.

E. Berthier (Editor)

etienne.berthier@legos.obs-mip.fr

Received and published: 12 July 2017

Dear Authors,

Although both reviewers seemed to agree on the importance of your continent-wide discharge and mass balance assessment, they raised substantial methodological issues. I have been reading carefully your answers to their comments. I appreciate your efforts to reconcile your values with the other similar study in discussion for TC. Unfortunately, I do not think you provided sufficiently convincing responses to warrant consideration of a revised version of your manuscript.

C1

Among the main weaknesses of the study are:

(1) The lack of clear time stamp for the velocity map. The availability of a new velocity product with well-defined time stamps should now be taken into account, at least by quantifying the errors involved when attributing all velocity measurements to a single year (2008, and not 2006). I agree that it is unfortunate that this product was available after your submission date, but still it should now be used to improve your study and aim at the best discharge estimate for the \sim IPY period.

(2) One major issue is the use of mainly BEDMAP2 as ice thickness data at the grounding line for ice discharge calculation. As reviewer#2 put it “While it is a straight forward calculation using these datasets, calculating discharge or mass balance (and changes) here requires accurate, detailed and well-defined gates and velocities inpointed to distinct time periods, otherwise it is a rather meaningless number and not the improvement that is actually needed.” The use of BEDMAP2 can lead to large systematic errors, as recently demonstrated for the Getz and Abbot sectors in Chuter et al. [2017]. It seems also mandatory to take into account the elevation change (mostly thinning) at / close to the grounding line that took place between 2008 and 2015. In term of mass flux, the thinning will possibly partly counteract the effect of the velocity increase. The fact that the total thinning between 2008 and 2014/15 is within uncertainties of the total ice thickness from Bedmap2 is not a good reason to neglect it because it could lead to systematic errors in your discharge assessment. For example, I do not think you neglected the velocity change when they are within error bounds of the velocity measurement.

(3) The highly unrealistic velocity variations in the Antarctic Peninsula (AP). Overall, the total mass balance of the AP (positive in your study) is in very strong disagreement with published results for this area using various techniques. The argument that you “did not draw conclusion” (your reply to reviewer#2) is not a satisfying one. A much more critical discussion is required; otherwise it weakens the rest of your conclusions.

To this list (a synthesis of the major reviewer’s comments), I would add the need to

C2

well-justify the use of a long term average (1979–2014 if I understood correctly) of the SMB to measure the total mass balance for two snapshots (2008 and 2014/2015). What justifies ignoring the inter-annual SMB variability?

Further, your main conclusion of increased mass loss in the Wilkes Land would need to be compared thoroughly to other assessments in this sector using different techniques (altimetry, gravimetry, other I/O estimates if available). The need for such a comparison is in fact true for all your study regions to put/back up your findings based on the existing literature. Providing all numbers from the literature in an excel spreadsheet (Table S4) is certainly useful for some readers but does not help to see the agreement/disagreement between yours and previous studies.

Your continent-wide velocity maps and revised ice discharge and mass balance estimates will deserve publication in the future but require some additional data processing that goes beyond the scope of what can be done in the framework of the present submission.

I am sorry for not being more positive. I hope that the reviewer's comments will help you to re-submit a deeply revised version elsewhere.

Please do not hesitate to contact me in case you have any questions.

Best regards, Etienne Berthier – TC Editor

Reference: Chuter, S. J., Martín-Español, A., Wouters, B. and Bamber, J. L.: Mass Balance Reassessment of Glaciers Draining into the Abbot and Getz Ice Shelves of West Antarctica, *Geophys. Res. Lett.*, doi:10.1002/2017GL073087, 2017.

Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2017-34>, 2017.